Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

should be furnished. The teeth should be brushed twice daily with a soft toothbrush and a good dentifrice.

One of the chief difficulties in avoiding poisoning is the reluctance on the part of workers to report to the company physician when they begin to feel sick. This is due to the relatively high wages which are paid to the workers who load ammunition and the natural desire to keep on earning these wages as long as they are able to stand up. Much of this can be done away with by a system of rotation of jobs, workers being transferred from hazardous to less hazardous employment regularly at intervals of two weeks.

Hours of labor.—Except in an emergency no person engaged in a process in which trinitrotoluol is handled should work longer than eight hours a day. By thus limiting the time of exposure, the danger of poisoning may be materially reduced. As previously stated, workers engaged in hazardous processes should be rotated to less hazardous jobs at least once in every two weeks, and oftener if necessary.

Medical supervision.—An efficient system of medical supervision under the direction of a competent physician must necessarily be provided in all plants engaged in the manufacture and handling of trinitrotoluol. The physician in charge should be familiar with the symptoms of poisoning and the precautions for preventing it. He should keep a constant check upon the efficiency of the enforcement of sanitary precautions and be given the authority to transfer or to lay off, as may be required, all workers who are showing symptoms of poisoning. He should also make frequent rounds of inspection through the workrooms, noting all workers showing the characteristic appearance of trinitrotoluol poisoning, and requiring them to report to the works dispensary for further examination. Careful records should be kept of all cases of poisoning and their subsequent treatment.

TYPHOID FEVER SPREAD BY CHRONIC CARRIERS.

A REPORT OF SEVERAL SMALL OUTBREAKS OF WHICH THREE WERE MILK BORNE.

By Wm. Royal Stokes, M. D., Chief of Bureau of Bacteriology, Maryland State and Baltimore City, Departments of Health, and F. W. Hachtel, M. D., Assistant Bacteriologist, Baltimore, Md., Department of Health.

In order to emphasize the importance of the typhoid carrier in the distribution of the infection through the handling of food we have thought it might be of interest to add the cases which follow to the literature of this subject, and we shall first briefly describe a milk-borne epidemic in which the typhoid bacillus was isolated from the stool of a typhoid carrier on the dairy farm and also from the milk which produced the outbreak of typhoid fever.

In 1912, Stokes and Stoner[1] observed 56 cases of typhoid, during July, August, September, and October in a town of 2,500 inhabitants, and 50 cases were found on the milk route of one milkman furnishing 1,500 persons, while the four other milk men who served about 1,000 persons had only 6 cases on their dairy routes. A further investigation disclosed the fact that a woman in the dairy who had been handling the milk and dispensing it to customers had suffered from typhoid fever two years previously. An examination showed that the feces from this woman contained the typhoid bacillus. A later study of the milk for the presence of the typhoid bacillus resulted in the isolation of an organism which in all respects resembled the typhoid bacillus. The various confirmatory tests consisted of morphology and staining properties, cultural characteristics, agglutination tests with positive blood and immune typhoid serum, complement fixation tests and bactericidal tests.

During the past few years the departments of health of Baltimore and of Maryland have investigated a number of typhoid outbreaks, which studies entailed the examination of specimens from a number of people for the detection of carriers and resulted in the finding of several of these.

The first of these outbreaks consisted of a series of 22 cases which were traceable to milk. Connected with the handling of this milk was a woman who had had enteric fever about one year previously. An examination of specimens of her stool and urine demonstrated the presence of typhoid bacilli in both. No other carriers were detected among the other people employed at this dairy.

Another outbreak occurred in a college with about 600 students, of whom approximately from 200 to 300 were exposed to the source of infection, a lunch room that had in its employ a cook who was later found to be a typhoid carrier. Of those exposed to this source of infection, 11 developed enteric fever within a period of one month. After the discovery and removal of the carrier no other cases occurred.

Another outbreak was traced to a woman 75 years old, who had had typhoid fever in September, 1912. Before she entirely recovered her granddaughter, living in the same home, developed typhoid fever, and while the latter case was recovering this patient's 2-year old son developed typhoid fever and later died of this disease. In May, 1913, the older woman's son-in-law contracted typhoid fever and his daughter developed this disease in the latter part of July, 1916. A child aged 13 developed typhoid fever in November, 1916, and all of these three later cases were confirmed by the Widal reaction. In November, 1916, a boy aged 9 and a married woman who obtained their milk from the dairy of the original case developed typhoid fever.

---

[1] Jour. Amer. Med. Assoc., Pt. 1, Vol. LXI, Sept. 27, 1913, p. 1024.

Upon further investigation it was found that her son-in-law and his three children had been drinking milk which had been obtained from the dairy of the mother-in-law, being the original case.

In analyzing the above circumstances it would seem that the case of the granddaughter and a great-grandson of the original case might have been a house outbreak, although they very probably drank milk which was handled by the original case. The other cases would seem to be due to milk furnished by the original case, since an examination of the stools made five years after the attack of typhoid showed the presence of numerous typhoid bacilli.

In two other house outbreaks we found that there had been three cases of typhoid fever within a period of three years in one family, and upon examining the stool of the father of the household, who had had typhoid fever five years previously, we found the typhoid bacillus. In another case in which several members of the household had developed typhoid fever within a period of three years we found the typhoid bacillus in the stool of one of several sisters. Neither of these typhoid carriers cooked or handled food as far as we could learn, and it is difficult to trace out the exact method of causation of these cases.

The next investigation was that of four cases of enteric fever occurring in one family over a period of several months. This resulted in the discovery that the servant was a carrier, *B. typhosus* being isolated from his urine. In the course of the investigation specimens from the drainpipes of several refrigerators were sent to the department, and from one of these an organism which culturally resembles the typhoid bacillus was isolated. This bacillus is also agglutinated by the blood of typhoid cases and by typhoid immune serum. Further studies of this organism are being made and will be reported later by one of the authors. It is interesting to note that this organism was isolated from the material from the waste pipe of the pantry refrigerator, which could readily have become contaminated by the servant. In addition to the above-mentioned cases another was traceable to this same man. This was the servant's grandson, who lived with his grandfather.

Another familial outbreak studied consisted in all of three cases out of a family of six persons. The first was the mother of the family, followed four months after her recovery by her husband and four years later by her daughter. Feces and urine of both father and mother were examined in the course of the investigation and the stool of the latter was found to contain typhoid bacilli.

In another family four cases of enteric fever occurred over a period of four or five years. During the investigation suspicion was directed toward the cook by the following facts: She had lived with these people at the time of the first two cases, but later on left them for a period of two or three years, during which time no case developed in this household. Almost immediately upon her return to the family in capacity of cook the other two cases developed. The examination of her urine and feces resulted in the detection of *B. typhosus* in the latter. This woman denied having had typhoid, but has had several severe attacks of biliary colic.

Conclusion.

We believe that whenever possible domestics in private service and particularly those handling food in large public establishments should not be admitted to such positions until a careful inquiry has been made into their previous medical history as to a possible former attack of typhoid fever. If there is the slightest history of any continued fever resembling typhoid fever the stools and urine should be examined for the typhoid bacillus, and if possible a second examination should be made at the expiration of a week.

These methods are not only important when applied to domestic and public cooks, waiters, and other handlers of food or food utensils, but should also be applied upon the dairy farm, in the city dairies, in bakeries and bake shops, confectionery stores, green groceries, markets, and other places where food is handled.